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EXAMINER

MENEFEE, JAMES A

ART UNIT	PAPER NUMBER
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2828

DATE MAILED: 10/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/877,923

Applicant(s)

DEICHSEL ET AL.

Examiner

James A. Menefee

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 25 August 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-5 and 7-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5 and 7-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

  
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## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Response to Amendment***

In response to the amendment filed 25 August 2003, claims 1, 3, and 15 are amended.  
Claims 1-5 and 7-26 are pending.

### ***Claim Objections***

Claims 11 and 19 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claims 11 and 19 merely recite a limitation regarding the method of forming the device. The method of forming a device is not germane to the patentability of the device itself, and thus this method is not given patentable weight. Since the claim is not given any patentable weight, then the claim contains no limitations, and thus does not further limit the parent claim.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-13, 22, and 24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The intermediate layer of claim 1 is claimed as "optional". It is indefinite whether the invention requires this layer to be included in the device. Since the

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dependent claims further limit the layer, it is deemed to be required by the invention, and thus the term "optional" should be removed from claim 1.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-5, 7, and 9-26, are rejected under 35 U.S.C. 102(e) as being anticipated by Weingarten et al. (previously cited US 6,393,035). Weingarten discloses the claimed invention as follows (see esp. Figs. 9-11 and discussion thereof):

Regarding claim 1, Weingarten discloses a saturable reflector for a laser wavelength  $\lambda$  wherein a reflector 41 comprising a first reflector material 42.1-p and a second reflector material 43.1-p is applied to a surface of a substrate 40, and a layer sequence 44-46 with a saturable absorbing effect is applied onto the reflector, characterized in that the laser sequence 44-46 contains a strained quantum well 44, a cap 45 (to the right of 44), and intermediate layer 45 (left of 44). The layer 45 is disclosed as transparent, and thus is an antireflective layer. The layer sequence is disclosed as a half wavelength layer, thus is a whole number multiple of  $\lambda/2$ . The material composition of the cap layer (45 right) and the intermediate layer (45 left) independently comprise GaAs, which is the same as one of the reflector materials. It is inherent that the material composition of the quantum well 6, its layer thickness, and its strain in

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the layer structure will serve to define the absorbing effect within a wavelength range including  $\lambda$ . It is inherent that the degree of saturable effect is defined by the distance between the strained quantum well and the boundary of the cap layer. The reflector will not be disposed in a vacuum, and thus is adjacent to a surrounding gaseous medium.

Regarding claim 2, the quantum well 6 is adjacent to the cap layer (45 right).

Regarding claim 3, the quantum well 6 is surrounded by the intermediate layer and the cap layer 45.

Regarding claim 4, the material of the intermediate layer is identical to that of the cap layer.

Regarding claims 5 and 22, the intermediate layer is made of the same material as one of the reflector materials, and thus the lattice mismatch between such materials will be less than that claimed.

Regarding claim 7, Weingarten discloses that the layers of the reflector may be GaAs and AlAs, and it is disclosed that the optical thickness of these layers is  $\lambda/4$ . This leads to the physical thicknesses as claimed (optical thickness = (physical thickness) x (refractive index)). The quantum well is made of  $\text{In}_x\text{Ga}_{1-x}\text{As}$ . It is inherent that these materials will have the effect as claimed.

Regarding claim 9, the reflector is a highly reflective metal mirror.

Regarding claim 10, the cap layer is coated with an antireflective passivation layer 46.

Regarding claim 11, the claim is not given patentable weight as shown in the objections above.

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Regarding claim 12, the layer sequence is shown to be a multiple of  $\lambda/2$  as in the rejection of claim 1 above. The layer sequence only includes the layers shown in claim 12.

Regarding claim 13, the adjacent layers to the quantum well are thicker than the quantum well. The adjustability of the saturable absorbing effect is inherent.

Regarding claim 14, the limitations are all shown as in the rejection of claim 1. Further, as the GaAs layer 45 is disclosed as transparent, the substrate 40 that is also made of GaAs will also be transparent.

Regarding claim 15, the quantum well 6 is surrounded by the intermediate layer and the cap layer 45.

Regarding claim 16, the material of the intermediate layer is identical to that of the cap layer.

Regarding claims 17 and 23, the intermediate layer is made of the same material as the substrate materials, and thus the lattice mismatch between such materials will be less than that claimed.

Regarding claim 18, the cap layer is coated with an antireflective passivation layer 46.

Regarding claim 19, the claim is not given patentable weight as shown in the objections above.

Regarding claim 20, the layer sequence is shown to be a multiple of  $\lambda/2$  as in the rejection of claim 1 above. The layer sequence only includes the layers shown in claim 12.

Regarding claim 21, the adjacent layers to the quantum well are thicker than the quantum well. The adjustability of the saturable absorbing effect is inherent.

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Regarding claim 24, the material of the intermediate layer and of the last layer of the reflector 43.p are both GaAs.

Regarding claims 25-26, the limitations are taught as in the rejections of claims 1 and 14. Due to the materials involved, the lattice mismatch will inherently be as claimed. The rest of the limitations are simply claimed properties (i.e. degree of saturable effect), and are also inherent.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Weingarten in view of Cunningham et al. (previously cited US 5,701,327). Weingarten discloses that the layers of the reflector may be GaAs and AlAs, and it is disclosed that the optical thickness of these layers is  $\lambda/4$ . This leads to the physical thicknesses as claimed (optical thickness = (physical thickness) x (refractive index)). It is not disclosed that the quantum well should be made of the materials as claimed. Cunningham shows that these materials for use as a quantum well in a saturable reflector are known in the art (par. bridging col. 5-6). It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the quantum wells out of this material, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a

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matter of obvious design choice. *In re Leshin*, 125 USPQ 416. It is inherent that these materials will have the effect as claimed.

### ***Response to Arguments***

Applicant's arguments filed 25 August 2003 have been fully considered but they are not persuasive.

Applicant argues against the objection of claims 11 and 19 (p. 8 of response). The applicant argues that the method of forming the device should be given patentable weight because the method defines additional structure. This is not persuasive. The method of forming a device is not germane to the patentability of the device itself. The method claim, in and of itself, does not define any structure. If the applicant wishes to receive protection for a quantum well that is formed using such a method, then the structure of the well formed by said method should be positively recited in the claims.

Applicant argues against the rejection under 35 U.S.C. 112 (p. 9 of response). The argument is not persuasive. By using the term optional, it is not definite what protection the applicant is seeking in the patent. If the applicant does not want to limit the claim by removing the term optional (so that it must include the intermediate layer) then the entire term should be removed, and then the layer should be positively recited in the dependent claims that do include this layer.

Applicant argues that the rejection using Weingarten is not proper because Weingarten does not disclose a strained quantum well layer. This argument is based on the assertion that the quantum well layer of Weingarten is unstrained.



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Applicant states that the quantum well layer of Weingarten has a composition and thickness such that the critical thickness is exceeded. The critical thickness is that shown in the Matthews-Blakeslee theory. Applicant asserts, based on the references to Brech and Kolbas et al., that when the critical thickness of a layer is exceeded, then the layer is unstrained (p. 10-11 of applicant's response). However, there is nothing in these references to show that a layer exceeding the critical thickness is not a strained layer. Brech states, in the section explaining Fig. 2.5:

The theory of Matthews and Blakeslee is confirmed by various data of the literature. Samples below the critical thickness exhibit a low dislocation density whereas samples above the critical thickness show a high dislocation density, i. e. the strained layer starts to relax. The asterisk symbols in Figure 2.5 represent samples with moderate dislocation density. This shows that the transition from pseudomorphic growth to relaxation is not abrupt.

It is not disputed, based on Fig. 2.5 of Brech and the composition disclosed in Weingarten, that the layer of Weingarten exceeds the critical thickness as defined by the Matthews-Blakeslee theory. However, the Examiner is not convinced that this shows the layer of Weingarten is not strained. Brech shows that the transition to an unstrained layer is "not abrupt". Brech only states that when the critical thickness is exceeded, "the strained layer *starts* to relax" (emphasis added). While the layer of Weingarten may be more relaxed than other strained layers, it is not shown that the layer completely lacks strain.

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Kolbas further shows that it is preferred for a strained layer to be formed such that this critical thickness is not exceeded. However, as in Brech, there is nothing in Kolbas that states that a layer exceeding the critical thickness is not strained. Just because a layer exceeding the critical thickness is not the preferred strained layer, does not mean that it is not a strained layer at all. In fact, Kolbas discusses, in the discussion of Fig. 2 (p. 1606), two layers that would also seem to exceed the critical thickness based on Fig. 2.5 of Brech. However, Kolbas refers to these as strained layers.

The Examiner also looks to the reference cited herein to Shieh et al. (Electronics Letters, Aug. 1989). This reference refers to strained layers that have thicknesses of twice the Matthews-Blakeslee critical thickness. It appears that such layers, while perhaps having poorer degradation characteristics, are still strained.

Again, as stated above, it is not disputed that Weingarten's quantum well exceeds a critical thickness under the Matthews-Blakeslee model, and as such may offer poor performance in comparison to a layer that does not exceed the critical thickness. However, this is not the point of the argument; the argument is whether or not the layer of Weingarten is a strained layer. The evidence is not convincing that the layer is not strained.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO**

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MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A. Menefee whose telephone number is (703) 605-4367. The examiner can normally be reached on M-F 8:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Ip can be reached on (703) 308-3098. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.



JM  
September 16, 2003



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